TECHNICAL PROPOSAL

FOA NUMBER:	N00014-21-S-F004
PROPOSAL TITLE:	DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce
PRIME APPLICANT:	Applied Physics Laboratory University of Washington 1013 NE 40th Street, Box 355640 Seattle, WA 98105-6698
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1. Technical Approach

1.1 Introduction and Background

As one of five Navy University Affiliated Research Centers (UARC), The Applied Physics Laboratory at the University of Washington (APL-UW) has contributed to the Naval Research Enterprise for over 75 years. Over the past 15 years, we have focused on strengthening and broadening our STEM activities through support of graduate students and postdoctoral fellows. We have more than 40 scientists with Affiliate, Research, or Regular Faculty appointments who currently provide funding and supervision for over 35 graduate students. Our internally funded Science and Engineering Enrichment and Development (SEED) postdoctoral fellowship program was established in 2013 and has sponsored a total of 15 fellows (60% women, 33% minority), with 8 subsequently hired by APL-UW as Principal Investigators (PIs). While individual PIs have employed or mentored many undergraduate interns over the years focusing on specific research needs, this year through facilitated efforts an Internship Program was launched centrally. The first student groups engaged were from the Pacific Northwest Louis Stokes Alliance for Minority Participation[1] (PNW LSAMP) and Naval Reserve Officers Training Corp (NROTC). The academic year and summer activities have sponsored a total of 7 interns to date. We now seek to expand our Internship Programming to strengthen the pathway to DON STEM opportunities, with emphasis on Diversity, Equity, and Inclusion (DEI).

Over the past year, APL-UW has established a DEI Working Group to advise the Executive Director on promoting outreach to underrepresented communities and the participation of underrepresented individuals in all aspects of APL-UW activities. A total of 25 employees from both administrative and research departments have recently completed the nationwide NSF-sponsored URGE[2] (Unlearning Racism in Geoscience) program, which has raised awareness of local and community-wide DEI issues. These recent activities have led us to conclude that establishing a robust and supportive undergraduate internship program will provide an immediate and lasting impact in broadening APL-UW's contribution to maintaining and diversifying the DON workforce. We propose to establish a summer undergraduate internship program at APL-UW to be called DID-NOW (Developing an Inclusive and Diverse Naval Oceanographic Workforce), which will be targeted to provide students from historically underrepresented groups with DON-relevant research experiences.

Undergraduate internships can be especially effective in directing students to pursue new career paths because the participants tend to be eager to learn and open to new opportunities, but uncertain of their direction. APL-UW's extensive and wide-ranging research programs can provide stimulating and life-changing experiences that broaden education beyond the classroom and motivate students to pursue STEM careers with Navy relevance. Our approach will be to establish a comprehensive summer undergraduate fellowship program that will provide (1) project-based research experience, (2) mentoring and support outside the research activity, (3) community

[1] https://depts.washington.edu/lsamp/
[2] https://urgeoscience.org/

building and support opportunities through peer-to-peer relationships, and (4) tools and strategies to navigate the pathways to a Navy-relevant career. This broad-based strategy is intended to go beyond the research experience itself by providing supplemental perspectives and resources to participants. Weekly meetings will include guest speakers in Navy-related jobs, tours of APL-UW laboratories and facilities, and career counselors familiar with DON STEM pathways. Interns will present the results of their research at a lab-wide colloquium that will be advertised and open to the UW community, Navy and outside partners, and local maritime industry. The program will include community-building activities to enable the intern cohort to strengthen peer to peer relationships. All interns will be given the opportunity to participate in a one-day training cruise on the UW research vessel R/V *Rachel Carson* in Puget Sound to understand and experience oceanographic techniques such as CTD casts and water sampling, operation of autonomous vehicles, and remote sensing.

Several recent articles have noted that the geosciences, and oceanography in particular, have significant underrepresentation of women and minorities with regard to recruitment, retention, and promotion in academic and research positions [*Bernard and Cooperdock*, 2018; *Garza*, 2021; *Gilligan et al.*, 2007; *Griffin*, 2020]. If women, underrepresented minorities, and other groups are fully represented in oceanographic and naval fields, our profession and nation will be stronger, broader-based, and more innovative [*Phillips*, 2014]. Recruitment for DID-NOW will target underrepresented groups in STEM, with emphasis on racial and ethnic minority students and military-connected students. Our strategy to encourage minority participants will build on existing partnerships with organizations that can assist us in broadening the pool of applicants, such as PNW LSAMP, the National Society of Black Engineers[3], Northwest Indian College[4], and other tribal colleges and Historically Black Colleges and Universities.

The growing need to expand DON STEM opportunities combined with APL-UW's Navy-centric research and the urgency to address DEI needs has led us to seek the establishment of a long-term program supported by a permanent staff member with expertise in STEM education and DEI. Therefore, our long-term goal is to establish a permanent position for an individual to coordinate programs related to training and educating the future Naval STEM workforce. To that end, we will supplement the proposed budget with laboratory discretionary funds sufficient to support a program coordinator for a period of up to two years. In addition to administering the proposed program, the coordinator will pursue other STEM funding opportunities to broaden and diversify STEM training and education at APL-UW. The period of internal support is intended to allow time to establish additional STEM funding from a variety of sponsors to ensure longevity of the DID-NOW internship program and other STEM activities.

1.2 Scientific and Technical Merits

The main objective of the DID-NOW internship program is to encourage undergraduate students to pursue a Navy-relevant STEM career. A summer internship at APL-UW is an ideal mechanism to achieve this objective. As a Navy UARC, we conduct a wide range of research relevant to Navy careers. Much of our research is field-based, providing a cornucopia of hands-on activities for undergraduate research. We also do a significant amount of research using satellite and airborne remote sensing, autonomous ocean observing platforms, numerical modeling, and data analytics.

[3] https://www.nsbe.org/

[4] https://www.nwic.edu/

Interns will gain wide exposure to the breadth of oceanographic research, in-depth experience in how that research is conducted, and work in an environment which is supportive and engaging. The establishment of the DID-NOW internship program will significantly enhance our current outreach with PNW LSAMP and NROTC internship engagement by providing additional resources for recruiting, training, and administration.

The seven research departments at APL-UW that do Navy-relevant research are all participating in the proposed activity by contributing discretionary funds and sponsoring mentors. The departments are:

- **Air-Sea Interaction and Remote Sensing (AIRS):** The AIRS Department conducts research on the air-sea interface using various remote sensing techniques. Interests include global-scale processes of climate change and ocean circulation, regional studies of nearshore processes, and the small-scale physics of air-sea heat and gas exchange.
- **Environmental and Information Systems (EIS):** The EIS Department has three core research areas. (1) Acoustics and signal processing, (2) Environmental sensing and modeling, and (3) Information and control systems. Expertise is applied to the needs of the Department of Defense, other federal agencies, and industry.
- **Electronics and Photonic Systems (EPS):** The EPS Department develops and builds state-of-the-art solutions to challenging problems faced by the US Navy and provides engineering solutions for the installation and support of cabled ocean observatories.
- **Ocean Acoustics Department (OAD)**: The Ocean Acoustics Department studies the propagation and scattering of sound in the ocean. Its primary focus is to study the ocean and ocean structure using theory, numerical modeling, and field experiments.
- **Ocean Engineering (OED):** The Ocean Engineering Department delivers science and technology solutions at sea. The department serves as a resource to scientists at APL-UW, other research and development organizations, and the US Navy.
- **Ocean Physics Department (OPD):** OPD investigators pursue research focused primarily on small-scale and meso-scale oceanographic processes and design and build unique instruments to facilitate these studies.
- **Polar Science Center (PSC):** The Polar Science Center conducts interdisciplinary research on the oceanography, climatology, meteorology, biology, and ecology of ice-covered regions on Earth and elsewhere in the solar system.

Mentor Projects

Each department has contributed potential projects for this proposal, which are listed in Table 1 by title, mentor, and mentor experience highlights. The proposed mentor projects span the research departments at APL-UW and a broad range of topics covering engineering, data analysis, and physical and biological oceanography. The paired mentors all have at least two years of experience working with high-school through graduate students and many also have affiliate faculty positions within the University representing the colleges of Oceanography, Fisheries, and Civil and Environmental Engineering.

Topics are varied to accommodate the expected range of interests and strengths that accepted interns will possess and will balance designing for success and student enthusiasm with challenging growth opportunities. Project goals will be individually tailored to a range of experience (e.g., expected differences in early versus late-stage undergraduate skills) through

strategies such as breaking tasks into multiple, more approachable intermediate goals, pairing interns to work together on a single project, or adjusting expectations (see section 1.3b).

The projects listed in Table 1 can be broadly grouped into the following themes:

- Unmanned Underwater Vehicles (UUVs)
- Underwater acoustics
- Remote sensing and coastal oceanography
- Engineering and system/sensor development and testing
- Ocean data science and analysis

Table 1. Potential Internship Projects

Project Title	Mentor	Mentor Experience Highlights
Unmanned aerial vehicle (UAV) measurements for small-scale, ocean surface processes and object detection funded by NAVSEA	Chris Chickadel AIRS	Assistant Professor (Civil & Environmental Engineering), advisor and committee member for 8 MS and PhD students, 9 years of mentoring undergraduate and high school students
Video remote sensing and machine learning identification of rip currents and other beach hazards funded by ONR Coastal Geosciences	Melissa Moulton AIRS	Assistant Professor (Civil & Environmental Engineering), advised interns for 2 years in the Significant Opportunities in Atmospheric Research and Science (SOARS) programs.
Biomimetic study of marine mammal propulsion and buoyancy with applications to autonomous underwater vehicles	Peter Brodsky EIS	Mentored numerous undergraduate interns over 20+ years, particularly UUV analysis and design Yearly volunteer judge for the MATE (Marine Advanced Technology Education) ROV competition.
Processing water column sonar data offshore the Pacific NW and linking derived biological measures to data from satellites and other instruments	Emilio Mayorga EIS	Mentored several undergraduates over the last few years in environmental data processing and analysis projects. Member of Pacific NW LSAMP UW Faculty Mentoring Committee. Co-lead and instructor for annual OceanHackWeek data science in oceanography event.
Create new data visualization products from the OOI* data streams looking for correlated events between sensors.	Michael Harrington EPS	Worked with a number of undergraduates students on OOI projects to visualize camera imagery and hydrophone data.

Data analysis of OOI infrastructure to study monitored engineering values and failures.	Dana Manalang EPS	Has worked with a number of undergraduate students over the years on instrument maintenance projects and data analysis for OOI.
Sonar propagation on the Washington Shelf. Funded by ONR Acoustics.	Todd Hefner OAD	Mentored postdoctoral scholars in multiple acoustics research projects.
Quantifying biological interactions using active and passive acoustic data from the OOI Cabled Array.	Wu-Jung Lee OAD	Regularly mentors undergraduates on acoustics research. Led/co-led data science in oceanography workshop OceanHackWeek since 2018.
Passive acoustic signatures of weather events.. Funded by ONR Acoustic	Jie Yang OAD	Mentored postdoctoral scholars in research projects encompassing acoustic and oceanographic instruments.
Testing of field-scale marine current turbines and environmental monitoring equipment	Cassie Riel OED	Two years mentoring undergrads. Co-advisor team of 80 which has won five 1st place design awards at international competitions in the last two years.
Expand RAVEN ROV with new instruments, mounting systems, and peripherals.	Jessica Noe OED	Four years of mentoring undergraduate students, in both individual and interdisciplinary team settings
Using profiling floats for real-time ocean sampling: test deployment and data analysis funded by ONR Phys. Ocean.	Zoltan Szuts OPD	Two years undergraduate mentoring experience, past undergraduate went on to graduate studies doing oceanographic research.
Dynamics of marine heatwaves, hypoxic events, and ocean acidification using oceanographic data from NANOOS^{+} off the coast of NW Washington.	Jan Newton OPD, NANOOS	Professor (Oceanography), Mentored multiple undergraduate and graduate students over 30 years through formal mentoring and teaching roles. Recently hosted a Spring 2021 PNW LSAMP student.
Examine marine mammal biology and acoustics in Arctic. Funded by ONR Bio. Ocean. & Marine Mammals	Kristen Laidre PSC	Professor (Oceanography), taught ~400 undergraduates in her course; individually mentored over 15 undergrads and seven PhDs or MS students.

Development of data science tools to explore NASA satellite observations to study the cryosphere.	Anthony Arendt PSC	Mentored four undergraduates, one now a PhD student, two now in related industry jobs. Also involved in NASA Citizen Science and High Mountain Asia studies of the cryosphere.

[+]Northwest Association of Networked Ocean Observing Systems
*Ocean Observing Initiative. Includes the Regional Scale Nodes underwater cabled array (EPS)

1.3 Educational Pathways

1.3a Internship Program Description

The educational foundation of the summer internship program will be our partnership with the University of Washington Undergraduate Research Program (URP), which is under the auspices of the Undergraduate Academic Affairs office. The URP facilitates research experiences for undergraduates with UW researchers across campus. The program provides instruction on research methodologies and ethics and enables students to envision themselves as contributing participants in a community of scholars. The URP provides weekly events that include orientation, workshops, advising, and an end of summer celebration. These group activities will broaden the interns' experience beyond the research environment at APL-UW by connecting them with other undergraduates conducting research across campus. The URP also provides mentoring resources to assist researchers in integrating undergraduates into the knowledge-making process. This integrated approach engaging all participants will ensure uniform and thorough preparation of both students and mentors. Academic credit is available to students completing the URP program.

The internship will be a nine-week program aligned with the UW academic summer quarter, nominally running from mid-June to mid-August. The first week will be devoted to orientation, training, and project design with mentors. The curriculum will include a series of short-courses introducing oceanography and oceanographic engineering and the core set of methods and tools common to most scientific research projects. A complete list of short-course topics for the first week is given in Table 2.

Table 2. Week 1 short course topics

Topic	**Details**
Oceanography	Basics of oceanography
Statistics and Data Analysis	Introduction to mathematical methods used in oceanography
Excel, Matlab, and Python	A basic primer on coding, calculating, and plotting
Sensing the Ocean	Introduction to ocean sensing technology
Scientific Literature	Introduction to finding, reading, and citing scientific literature

Subsequent weeks will each include both a URP event focusing on research methods and an APL-UW event that will include seminars and tours focusing on Navy-oriented research and careers paths, which are outlined in Table 3. All interns will have the opportunity to participate in a one-day, hands-on measurements cruise in Puget Sound on the R/V *Rachel Carson* to learn data collection and sampling methods using advanced oceanographic instrumentation and techniques.

Additional opportunities for at-sea work will be available for those projects that require dedicated ship time. The final week will focus on presenting research results.

During the internship, student requirements will include:

- Attend URP and APL-UW events (Table 3)
- Mid-summer progress report
    - Brief summary presentation of progress to date
    - In-person meeting of the program coordinator with both the student and mentor
- End of summer
    - Written report
    - Public oral or poster presentation of results

Table 3. Tentative weekly schedule of URP and APL-UW events

Week	URP Event	APL-UW Internship Event
2	Scientific Writing	Tour of the Applied Physics Lab, dock and research vessels
3	Graduate School and the NSF GRFP	Talks by APL graduate students on their research, including Q&A panel
4	Cultivating Rewarding Professional Relationships and Navigating Challenges in Research Environments	Department Overview and Highlights Ocean Acoustics Air-Sea Interaction and Remote Sensing
5	Research Ethics and Diversity	One-day research cruises on the R/V *Rachel Carson*
6	Applying for Scholarships and Personal Statement Workshop	Department Overview and Highlights Environmental Information Systems Electronics and Photonics
7	Oral Communication Workshop	Department Overview and Highlights Ocean Physics Polar Science Center
8	Community Based Research	DON Careers: Q&A Panel with DON collaborators from NRL and NUWC
9	Summer Research Symposium	Reflection on Experience (combination of structured survey and free response)

The DON speakers for the APL-UW event in Week 8 will disseminate information on Naval programs and careers. The talks will be by colleagues from the Naval Research Laboratory (NRL) at both the Stennis Space Center (NRL-SSC) and Washington, DC (NRL-DC), the Naval Information Warfare Center (NIWC), and the Naval Undersea Warfare Center at Keyport, WA (NUWC-Keyport):

- Joe Calantoni, Sarah Trimble, Allison Penko, NRL-SSC (Code 7354 Seafloor Sciences Branch), joe.calantoni@nrlssc.navy.mil
- Erika Johnson, NRL-DC (Code 7233 Coastal and Ocean Remote Sensing Branch), erika.johnson@nrl.navy.mil

- Colin Reinhardt, NIWC-Pacific, colin.reinhardt@navy.mil
- Aaron Darnton, Chief Technology Officer at NUWC-Keyport, aaron.darnton@navy.mil
- Johannes Schonberg, Director, NW Tech Bridge, johannes.k.schonberg@navy.mil

1.3b Mentor Training

The heart of the internship will be the pursuit of an independent research project under the guidance of a member of the research staff. The projects will typically be suggested by the mentor and agreed upon jointly by both the student and mentor. The advisor and program coordinator will help the student select and design a project that can result in a meaningful outcome in nine weeks.

Since the mentor plays a critical role in the intern's success, the URP provides mentor training and orientation in addition to student support. Mentor orientation begins with explaining the goals, timelines, and deliverables of the program. A clear understanding of the type of mentoring and effort expected is essential. We acknowledge that most of our mentors belong to a different cultural or ethnic group than the students we seek to recruit and that implicit bias can hinder student progress in geosciences [*Dutt*, 2020]. Developing an inclusive and supportive internship program will require conscious effort and recognition of cultural barriers and their impact on mentoring [*Linder et al.*, 2015; *Sue*, 2016]. Specific training workshops for mentors include:

- Implicit Bias Education Seminar
- Anti-harassment and Anti-discrimination Education and Expectation

The URP mentor orientation program consists of steps to developing a successful mentor/mentee relationship in three phases [*Decosmo and Harris*, 2006]:

- Phase I: Planning for a mentee
- Phase II: Integrating the mentee into the research environment
- Phase III: Fostering growth

The first phase is for the mentor to identify and design a good research project. Elements of a good research project include [Handelsman, et al., 2005]:

- A reasonable scope
- Feasible
- Generate data that the student can present
- Do not rely on "cookbook" experiments
- Built-in difficulties that will be faced after the student has developed some confidence
- Multi-faceted

A good project description will be understandable for a non-expert and will clearly describe what the student will do and how it fits into the bigger picture of the mentor's research. The mentor will specify the time commitment and any course prerequisites or required experience or skills. The degree of oversight should be clear, with a minimum commitment of weekly 1-hour meetings between the student and advisor. If possible, secondary mentors, such as graduate students or postdoctoral associates, will be made available, since multiple mentors have been shown to improve confidence and progress [*Blake*, 2013; *Hunter et al.*, 2007; *Johnson*, 2016]. The level of independence the project requires will be considered and mentors will provide material such as websites or articles for candidate mentees to familiarize themselves with the topic.

The second phase of integrating the mentee into the research environment requires mentors to take the time to know the student in terms of their ability, interests, and motivations. Since interns may be from a different ethnic group or background than the advisor, significant emphasis needs to be placed on empathy, which has been identified as a critical skill in healthy intercultural communication [Cornett-DeVito and Reeves, 1999]. This may require mentors to broaden their knowledge of different cultural groups. Clarifying expectations is important since some interns may not have held a research job before. Work habits that are important to the project need to be established and expectations and procedures for interruptions in scheduled work should be clear. Orientation is critical to integrating the mentee. Important elements include introducing the student to resources, including people and equipment. Meeting schedules and expectations for progress reports need to be established, with emphasis on discussing and identifying milestones for success.

The third phase of fostering growth requires open and ongoing communication. Regular reporting and discussion of progress should include recognition of the student's accomplishments. The mentor also needs to be open to checking-in regarding workload, stress level, and how to address potential frustration with the progress of research.

The establishment and success of a program that is diverse, equitable, and inclusive requires that each of these elements be addressed and nurtured at an institution-wide level. Therefore, the program will also include an element of APL-wide education and training on the importance and relevance of DEI issues to our ongoing and future role as a UARC in support of the Naval Research Enterprise.

1.3c Program Scope

Ideally, for a three-year effort we would propose a program for ten students each summer for the three summers in the award period. However, since the estimated award start date is 4/15/22, we do not believe that we could hire a program coordinator in time to implement the program as designed in the summer of 2022. Therefore, we will plan to have internship programs for 15 students each summer in 2023 and 2024. To administer the DID-NOW program, the budget includes 2.75 months per year of salary support for the program coordinator. Discretionary funds totaling $210,000 (equivalent to $518,700 in grant funds) from the participating APL-UW research departments will be used to supplement the support for the program coordinator to provide a total of two years full-time effort over the three-year grant period. This support will allow the program coordinator to submit proposals for STEM opportunities that will enable the DID-NOW program to continue beyond the period of the proposed activity.

1.4 DEI Aspects and Recruitment

1.4a Program Advertisement & Student Recruitment

The DID-NOW summer internship program is designed to facilitate the pursuit of Navy-relevant STEM degrees for undergraduate students from groups that are historically underrepresented in STEM fields, including Black or African-American, American Indian or Alaska Native, Hispanic or Latino, female or nonbinary, first-generation college students, veterans, students from military families, and students with disabilities, though we will accept applications from all undergraduates nationally. Our strategy to recruit such students will build on new and existing partnerships with two-year colleges, tribal colleges and organizations, non-doctoral universities, campus affinity groups, and Navy labs listed in Table 4.

Table 4. Partnering Organization (see attached letters of support)

Program and Contact	Institutions/Locations	Mission
UW Undergraduate Research Program. Janice DeCosmo and Sophie Pierszalowski	University of Washington, Seattle, WA	Facilitates research experiences for undergraduates with UW faculty members across the disciplines
Pacific Northwest Louis Stokes Alliance for Minority Participation Contact: June Hairston	Boise St. U., OR St. U., Portland St. U., UW, WA St. U., Col. of W. Idaho, Linn-Benton Col., Portland Com. Col., Seattle Central Col. and Yakima Valley Col.	"Increasing the quality and quantity of students successfully completing STEM baccalaureate degree programs, and increasing the number of students interested in, and academically qualified for matriculating into programs of graduate study."
FUW National Society of Black Engineers Contact: Fethya Ibrahim	University of Washington, Seattle, WA	"To increase the number of culturally responsible Black Engineers who excel academically, succeed professionally and positively impact the community."
Northwest Indian College Contact: Melissa Peacock	serves Washington, Oregon, and Idaho	With its main campus located on the Lummi Indian Reservation in Washington State, NWIC is the only accredited tribal college in WA, OR and ID.
Columbia River Inter-Tribal Fish Commission Contact: Aja K. DeCoteau	Washington and Oregon	"To ensure a unified voice in the overall management of the fishery resources, and as managers, to protect reserved treaty rights through the exercise of the inherent sovereign powers of the tribes."
Naval Undersea Warfare Center (NUWC), Keyport Contact: Aaron Darnton	Keyport, WA	"Support the Fleet with the technology to maintain and expand our technical advantage." including "to develop a diverse, well-educated workforce ready to meet the Navy's challenges of today and tomorrow."
NANOOS - NW Association of Networked Ocean Observing Systems Contact: Jan Newton	Washington and Oregon	Regional Association of the national Integrated Ocean Observing System (IOOS) in the Pacific Northwest

Port Gamble S'klallam Tribe Natural Resources Department Contact: Julianna Sullivan	Washington	"Sustainably managing, protecting, enhancing, conserving, and restoring culturally-relevant species, landscapes, and seascapes integral to the S'Klallam People"

Recruitment from military groups will be through our current connection to NROTC and a new partnership with NUWC-Keyport, with which we have ongoing collaborations and thus may also provide opportunities for research experience. Our primary contact at NUWC-Keyport is Aaron Darnton, Chief Technology Officer. They anticipate offering tours of their campus and labs to the undergraduate cohort, and engage the students with presenters on topics ranging from academic science and technology to Navy culture needs. Additional partnering will be pursued with Johannes Schonberg, Director of NW Tech Bridge, who has close ties with NUWC activities. Another potential source of interaction for the students will be with the Unmanned Undersea Vehicles Squadron ONE Command (UUVRON-1), which has a "Homeport" relationship with NUWC-Keyport through a shared campus, and which has direct research links with APL/UW. The presence of UUVRON-1, and the potential for undergraduate students to interact opportunistically with their active duty personnel or to engage on joint projects undertaken with APL, will further enrich the student's knowledge of Navy careers and areas of research.

We also have extensive partnerships with several Pacific Northwest tribes and tribal organizations, including the Northwest Indian College, the Quileute Tribal School, and the Columbia River Inter-Tribal Fish Commission, through the NOAA-funded Northwest Association of Networked Ocean Observing Systems (NANOOS), which is headquartered at APL-UW. These organizations, several of whom have provided letters of support for this proposal, can assist us in broadening the pool of applicants and can provide additional services to students in the DID-NOW program.

The DID-NOW summer internship will be advertised in phases. For the first year of the program, we will target existing connections within Washington state, while encouraging all contacts to share the program information broadly. For the second year of the program, we will expand our recruitment strategy by working with our partners to send the summer internship advertisement to sister programs nationwide.

We will feature the DID-NOW internship advertisement prominently on the APL-UW website. Since several potential mentors have affiliations with UW Oceanography, Civil & Environmental Engineering, and other departments on campus, we can also advertise on those websites. Some of the APL-UW staff who contributed to this proposal have strong ties to affinity groups on campus, such as UW Chapter of the Society for the Advancement of Chicano and Native American Students (SACNAS), and can post flyers, send emails, and provide on-site visits with Q&A sessions for direct outreach to students underrepresented in STEM. Collaborating with community colleges, through networks like the Washington Mathematics, Engineering, Science Achievement Community College Program, we will invite faculty to identify promising students and encourage them to apply. Direct faculty outreach has been previously demonstrated to be effective at encouraging underrepresented minority (URM) participants, who may otherwise perceive themselves as unqualified (Meza, 2019). We will also combat self-exclusion from applying

through intentional recruitment postings and interactions, including expected level of coursework and in-lab experience.

Two complementary partnerships that APL-UW has established in the past year will be assets to the DID-NOW program. First, APL-UW collaborated with the Navy ROTC at UW, most recently providing an opportunity for student interns to participate in an engineering field test of the Multi-Sensor Towbody system, a new system that has been developed to detect, geolocate and classify munitions in an underwater environment. We can recruit Navy ROTC students and outreach to Navy-affiliated families through this established relationship. Second, APL-UW partnered with the UW-hosted PNW LSAMP program and hosted undergraduate interns. The goal for the APL-UW LSAMP internships was to expose a diverse group of students to APL-UW research (e.g., oceanography, remote sensing, systems engineering, medical instrumentation development) and careers (e.g., scientist, marine tech, engineer, analyst, machine expert) so that they may develop a better understanding of themselves and their interests and gain confidence in their research abilities. The PNW LSAMP and Navy ROTC at UW communities will be important audiences for recruiting diverse DID-NOW applicants from the UW and other universities and community colleges in the Pacific Northwest.

The DID-NOW undergraduate summer internship will also be made accessible by stating the program content and expectations clearly on the program website. We will post all program information, including the anticipated schedule, samples of potential projects (and in the future, completed projects), and an evolving FAQs page. Faculty will provide short, informal biosketches and accessible descriptions of their science and recent projects. We will also provide biosketches and contact information for several APL-associated undergraduate and graduate students, whom applicants may be more comfortable contacting. We will foster an intern cohort by asking DID-NOW participants to serve as student ambassadors for future applicants and encourage ongoing application from within their colleges. Peer-to-peer encouragement has also been demonstrated to be a vital component of recruiting and retaining underrepresented groups (Meza, 2019). Interns will be featured in our ongoing series of professionally produced videos like this one about working at APL, which features the surfacing of a US Navy submarine during field exercise in the Arctic.

Beyond this outreach, we have tailored the program to attract and serve underrepresented students. We recognize that there may be cultural, religious, and logistical barriers to participation in our program, particularly around issues of travel and housing. As such, we commit to working with accepted applicants to address specific needs, such as alternative housing or childcare. Further, we will offer a range of research projects and accommodations to ensure that students with disabilities can fully participate. The UW Disability Resources for Students office has agreed to consult on these accommodations and share information with mentors as needed.

1.4b Application Process & Participant Selection

We seek participation from students who have completed their freshman year. Therefore, requirements for completed coursework will not be onerous. Additionally, the available projects will span a range of experience levels to accommodate a broad cohort. To have a positive experience in our program, it is important that students are familiar with fundamental math and science concepts, so we will require a minimum of one term of pre-calculus (or equivalent) and one term of a course in basic science or engineering. Experience in a lab-based course or with

computational software (like Excel, Matlab, Python, R, etc.) will be helpful but not required. We will not require letters of reference, but will accept a multiple choice assessment that is provided with the application from an educator that has taught the applicant. This will reduce the subjectivity and potential implicit bias of usual letters of reference [*Houser and Lemmons*, 2018]. We intentionally avoid a long-format personal statement, which can be ambiguous in content requirements and tend to favor those with greater exposure to higher education. In fact, one of our DID-NOW program activities (facilitated by URP) will be teaching the students to write a compelling personal statement. The short answer questions will gauge students' academic background broadly (e.g., Describe an academic challenge you faced and how you overcame it.) and enthusiasm for the Navy-relevant research topics specifically (e.g., "Why are you interested in this program and what question would you like to investigate?"). We will also ask students to connect science to their everyday lives by asking expository questions (e.g., "Describe an experience that sparked your interest in the natural world.").

Selection will be based on a holistic approach that will consider enthusiasm for the DID-NOW program, their life experiences as described in the short answers, and meeting the requirements for coursework. We anticipate selecting a diverse group of students from a wide range of backgrounds. By nature of the organizations, colleges, and community groups to which we will advertise the DID-NOW summer internship program, we are confident we can include Navy- or DoD-affiliated students within our cohort.

The application materials will emphasize that falling short of prerequisites will not necessarily result in rejection. Importantly, the application will encourage students to share about themselves rather than discourage or exclude applicants through extensive prerequisites. Finally, if a person participates early in their undergraduate career, they will not be excluded from applying again to build on their initial experience, which can provide a strong foundation for pursuing science beyond their undergraduate career.

The eligibility, selection, and mentor assignment components of the program are:

- Eligibility
    - Completed freshman year by the start of the fellowship period
    - Preference to students pursuing any field of science or engineering including biology, chemistry, engineering, geology, geophysics, mathematics, physics, and oceanography
    - Expresses an interest in oceanography or oceanographic engineering
- Selection
    - Applicants previous academic and scientific achievements, interests, and promise as a future ocean scientist or ocean engineer
    - Important consideration given to matching each intern with an appropriate mentor
    - Decisions made in mid-March
- Finding an advisor
    - Though not required, applicants will be encouraged to contact APL-UW researchers who may be willing to advise them
    - A list of potential projects and mentors will be posted on the website at the beginning of the application period

This general outline for the application process will be refined by the program coordinator hired for DID-NOW before the initial application period.

2. Naval Relevance and Partners

Our research portfolio includes physical oceanography (coastal, open-ocean, and polar regions), ocean engineering, underwater acoustics, ocean observing networks, and data science. These areas of research will expose undergraduates directly to the ocean environment and familiarize them with maritime careers in science and technology. Through hands-on activities with marine sensors, within research labs, and onboard research vessels, participants will work on marine-domain questions that are directly relevant to Navy needs. The research projects will generally fall under the Sensing and Sense-Making Framework Priority, combining the themes of sensors and technology with monitoring and predicting the operational environment. In particular, this undergraduate program will be relevant to the Navy by:

- attracting and training a workforce competent in marine science, technology, and data science
- exposing participants to basic and applied research, especially to DON-funded projects
- providing professional contacts and networking opportunities that include Navy-oriented researchers, collaborators from marine industries, and graduate programs in oceanography
- enabling follow-on opportunities by continuing research part-time during the school year (local or remote)

Our Navy partners listed in Table 5 are the Naval Research Laboratory (NRL) at both Stennis Space Center (NRL-SSC) and Washington, DC (NRL-DC), the Naval Information Warfare Center-Pacific (NIWC-Pacific), and the Naval Undersea Warfare Center at Keyport, WA (NUWC-Keyport). Our NRL and NIWC-Pacific partners will participate in the weekly seminar series by providing perspectives on working at a Navy laboratory. Our partnership with NUWC-Keyport will include both participation in the weekly seminar series and the potential for collaboration through internship projects. Synergy between APL-UW's experience and expertise in ocean research and unmanned underwater vehicle (UUV) development (Seagliders, Remus, Carina gliders, profiling floats) and NUWC's mission to develop naval science and technology including UUVs, as supporting UUVRON-1, will provide a strong Navy connection relevant to STEM education. The mission of NW Tech Bridge to connect academic and industry partners to Navy innovation centers makes it a natural fit to partner with APL-UW. Our proposed program will draw potential students from NUWC-Keyport families while also making students from elsewhere aware of the breadth of Naval careers, including NUWC-Keyport. Hands-on activities will include mission design and deployment, assisted by NUWC and other partners, of unclassified UUVs supplied by APL (REMUS, Seagliders, and profiling floats) to collect oceanographic and acoustic data in Lake Washington or Puget Sound.

Table 5. Navy Partners

Name	Affiliation	Contact Info
Joe Calantoni	NRL-SSC	joe.calantoni@nrlssc.navy.mil
Erika Johnson	NRL-DC	erika.johnson@nrl.navy.mil
Colin Reinhardt	NIWC-Pacific	colin.reinhardt@navy.mil
Aaron Darnton	NUWC-Keyport	aaron.darnton@navy.mil
Lt. Cmdr. Johannes Schonberg	NW Tech Bridge	johannes.schonberg@navy.mil

3. Project Schedule and Milestones

Year 1	
Date	**Activity**
4/15/22	Award start
5/15/22	Post program coordinator job announcement
7/15/22	Job posting closes
9/1/22	Program coordinator start date
11/15/22	Internship application period open
Year 2	
2/1/23	Internship application period closes
3/15/23	Applicants notified of decision
6/15/23	Internship begins
8/15/23	Internship ends
11/15/23	Internship application period open
Year 3	
2/1/24	Internship application period closes
3/15/24	Applicants notified of decision
6/15/24	Internship begins
8/15/24	Internship ends

4. Management Approach

The PI will be responsible for implementing the management approach. The program administration will include hiring a program coordinator and selection of a steering committee made up of at least one member of each of the eight APL-UW research departments. The PI will act as interim coordinator during the hiring search, which will begin upon award notification. The steering committee will contribute to all aspects of the program administration, including recruitment, selection, and extramural mentoring support during the internship period.

Co-Investigators Carini and Mayorga will organize and co-chair a search committee to recruit the program coordinator with assistance from key personnel Jones in his role as APL-UW Recruitment and Employee Development Manager. The qualifications for the program coordinator will include a doctoral degree in a science, engineering, education research, or related field and at least three years of culturally competent academic advising experience with students from a range of educational and experiential backgrounds in a diverse higher education setting. Jones will advise the program coordinator on DEI aspects of the program and facilitate integration with our existing PNW LSAMP and NROTC internships, which Jones currently administers.

5. Metrics of Evaluation

The primary goal of the proposed program is to introduce historically underrepresented and military-connected undergraduate students to Navy-relevant research and opportunities and to provide these students with positive, meaningful experiences. Success will primarily be based on the initial demographics of the students at intake and the outcomes reported by students and mentors participating in the program. Our evaluation goals will be to provide assessment information for transparency, accountability, and continuous improvement. We will be developing

an evaluation program drawing from the continuum outlined in *Sloan and Haacker* [2020] and in partnership with the UW Center for Evaluation & Research for STEM Equity (CERSE) and the UW-URP. Both CERSE and UW-URP have extensive and expert experience in helping to evaluate educational programs with specialized experience in assessing support for underrepresented and underserved students. Special care will be taken to create and administer surveys and demographic questions that are unbiased and that the metrics we track are relevant and quantifiable. Where appropriate, we will use personnel in CERSE and UW-URP to tabulate and aggregate survey data to prevent individual identification where that could be harmful.

The program assessment will primarily focus on the student experience and impact, as well as the experience of the mentors and program facilitators. Evaluations will address formative (in-process), summative (conclusion), and longitudinal (post-program) tracking of participants. Examples of these evaluations and their purpose is briefly described.

Formative: The program will begin with intake surveys of the students and will include demographic information, student identified goals, and current skills. The program coordinator will conduct face-to-face entrance interviews with each student to discuss expectations, training, and support needs. These will provide a baseline for concluding assessments of the individual program impacts and goals. Mid-program assessments will be group based and include general feedback on what is working and what could use improvement around the form of the program, quality of mentorships, and satisfaction with individual projects and progress. These will guide immediate course changes or reemphasis. Similar mentor-side surveys and group discussion will help direct improvement of the teaching and support and assess satisfaction of mentor participation.

Summative: Exit interviews will assess the efficacy of the research experience and perception of the inclusivity and culture of APL-UW, as well as successes and challenges of the program. The success of the program from the mentor perspective will be assessed via surveys that address program effectiveness, project quality, and perceived successes and growth of student skill development. We will also solicit feedback from outside (non-UW) participants, including Navy affiliates, presenters, and partner institutions, to assess their satisfaction with their participation in the program and provide an opportunity to suggest changes and improvements.

Longitudinal: We will assess the long-term impacts of the program by carrying out brief annual follow-up surveys with each participant with a goal of tracking their persistence in STEM undergraduate education, likelihood of pursuing graduate degrees, and career type and progress. Our plan is to make public the overall success of the program through aggregated (non-identifying) demographic data published on the APL front-facing webpage.

6. Qualifications

PI Jessup has over 30 years of experience in oceanographic research and teaching, supervising five undergraduate students, five graduate students, and seven postdoctoral fellows. As Chair of the APL AIRS Department over the past 15 years, he has hired and mentored ten Principal Investigators. He served as Chair of the APL SEED postdoctoral program for three years. He chaired the 2015 search committee for Assistant Director of Education and has served on several search committees for APL management positions.

Co-I Carini is a Senior Oceanographer in the Ocean Physics Department at APL-UW. Carini is primarily engaged as a scientist for the Northwest Association of Networked Ocean Observing Systems (NANOOS), and provides the program with administrative support. With NANOOS, she has co-mentored an APL-UW LSAMP intern and co-taught an undergraduate research apprenticeship at Friday Harbor Laboratories. Though early-career, Carini completed her Masters and PhD at APL-UW and therefore is familiar with lab operations and research areas.

Co-I Mayorga is a Senior Oceanographer in the Environmental and Information Systems Department at APL-UW. He has over 20 years of experience in environmental data informatics and oceanographic research and applications. He has mentored and supervised four undergraduate students, including an APL-UW PNW LSAMP intern. He is a member of the APL-UW DEI Advisory group, the PNW LSAMP UW Faculty Mentoring Committee and the Environmental Data Science Inclusion Network (EDSIN). He has been a co-lead or instructor for the annual OceanHackWeek events since their inception in 2018, which attract primarily graduate students and early career scientists but also include undergraduates.

Key personnel Jones is the APL Recruitment and Employment Development Manager. His duties include outreach and engagement related to all APL-UW recruiting initiatives. Activities focus on emphasizing the STEM-related opportunities at APL-UW, from interns to permanent staff, reach broadly across diverse populations. He is responsible for coordinating people related programming in APL-UW, such as the SEED postdoctoral fellowship program and Internship programming where relationships with the PNW LSAMP and NROTC have been established. He specializes in DEI and is a member of the UW Office of Research Diversity, Equity[5], and Inclusion Committee, the Diversity Council[6], and the HR Community of Practice Committees[7].

7. Responsibilities

- As an established UARC, APL-UW has the administrative and research resources necessary to complete the proposed activity.
- The PI, co-Is, and key personnel are experienced in complying with research grant conditions and have adequate time available.
- APL-UW administers over $80 million in federal awards on an annual basis. The PI has administered over $30 million dollars in Federal awards in his career. Previously awarded amounts will be expended based on the award period.
- APL-UW and the PI's records of integrity and business are impeccable.
- As a Navy UARC, APL-UW is qualified and eligible to receive an award under applicable laws and regulations.
- APL-UW has been a research unit of the University of Washington for over 75 years. As such, it has excellent organization, experience, accounting, and operational controls and technical skills. APL-UW has existing property control systems, quality assurance measures, and safety programs in place to perform the proposed activity.

[5] https://www.washington.edu/research/or/office-of-research-diversity-equity-and-inclusion/

[6] https://www.washington.edu/diversity/diversity-council/

[7] https://hr.uw.edu/vphr/cop/together-we-do/

8. Facilities and Equipment

General Resources:

The laboratory is a major research unit reporting directly to the Provost of the University of Washington and is located on the campus of the University of Washington close to Seattle's Lake Union waterfront. Our buildings comprise over 150,000 square feet, and are equipped with extensive machine and electronics shops, CAD/CAM facilities, publication facilities, and special purpose laboratories for microwave remote sensing, image processing, physical acoustics, and transducer testing. APL operates two vessels of its own; the University operates several others. Many of APL's 300 staff members teach university courses and supervise graduate students.

Computer Services:

The laboratory's computer center provides in-house computing services, as well as access to nationwide networks. A variety of personal computers are available for data acquisition and processing.

Machine Shop:

The laboratory maintains a well-equipped machine shop capable of making test models, production prototypes and precision instrumentation. The shop has lathes, milling machines, drill presses, grinding facility, CAD/CAM, pressure and heat treatment facilities and a carpenter shop.

9. Reports

We acknowledge that the following reports are required:

- Quarterly Technical Report
- Annual Research Performance Progress Report
- Final Report

10. References

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Blake, R. A., Liou-Mark, J., & Chukuigwe, C. (2013), An effective model for enhancing underrepresented minority participation and success in geoscience undergraduate research, . *Journal of Geoscience Education,*, *61*(4), 405-414.

Decosmo, J., and J. Harris (2006), Mentoring Undergraduate Researchers: Where to begin?, *Workshop for UW Postdoctoral Assoc.*

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Griffin, K. A. (2020), Institutional Barriers, Strategies, and Benefits to Increasing the Representation of Women and Men of Color in the Professoriate., in *Higher Education: Handbook of Theory and Research. Higher Education: Handbook of Theory and Research*, edited by I. P. L., Springer.

Houser, C., and K. Lemmons (2018), Implicit bias in letters of recommendation for an undergraduate research internship, *Journal of Further and Higher Education*, *42*(5), 585-595.

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Johnson, A., Huggans, M. J., Siegfried, D., & Braxton, L. (2016), Strategies for increasing diversity in the ocean science workforce through mentoring, *Oceanography*, *29*(1), 46-54.

Linder, C., J. C. Harris, E. L. Allen, and B. Hubain (2015), Building Inclusive Pedagogy: Recommendations From a National Study of Students of Color in Higher Education and Student Affairs Graduate Programs, *Equity & Excellence in Education*, *48*(2), 178-194.

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Sue, D. W. (2016), *Race talk and the conspiracy of silence: Understanding and facilitating difficult dialogues on race*, John Wiley & Sons.

BIOGRAPHICAL SKETCH: Andrew T. Jessup

(a) Professional Preparation

University of Michigan	Engineering Science	B. S. E. 1980
Massachusetts Institute of Technology	Civil Engineering	M S. E. 1988
Massachusetts Institute of Technology / Woods Hole Oceanographic Institution	Oceanography and Oceanographic Engineering	Ph. D. 1990

(b) Appointments

University of Washington

Applied Physics Laboratory

2005 – 2021	Chair, Air-Sea Interaction and Remote Sensing Department
2000 – date	Senior Principal Oceanographer
1995 – 2000	Principal Oceanographer
1990-1995	Senior Oceanographer

Academic

2011 – date	Professor, Department of Civil and Environmental Engineering
2002 – date	Affiliate Associate Professor, Department of Mechanical Engineering
2000 - 2011	Affiliate Associate Professor, Department of Civil and Env. Engineering
1992 – 2000	Affiliate Assistant Professor, Department of Civil and Env. Engineering

(c) Publications – Five most recent

Branch, R. A., A. R. Horner-Devine, C. C. Chickadel, S. A. Talke, D. Clark, and A. T. Jessup (2021), Surface Turbulence Reveals Riverbed Drag Coefficient, *Geophy. Res. Let.*, *48*(10).

Carini, R. J., C. C. Chickadel, and A. T. Jessup (2021a), Surf Zone Waves at the Onset of Breaking: 2. Predicting Breaking and Breaker Type, *J. Geophys. Res.-Oceans*, *126*(4).

Carini, R. J., C. C. Chickadel, and A. T. Jessup (2021b), Surf Zone Waves at the Onset of Breaking: 1. LIDAR and IR Data Fusion Methods, *J. Geophys. Res.-Oceans*, *126*(4).

Masnadi, N., C. C. Chickadel, and A. T. Jessup (2021), On the Thermal Signature of the Residual Foam in Breaking Waves, *J. Geophys. Res.-Oceans*, *126*(1).

Thompson, E. J., W. E. Asher, A. T. Jessup, and K. Drushka (2019), High-resolution rain maps from an x-band marine radar and their use in understanding ocean freshening, *Oceanography*, *32*(2), 58-65.

(d) Synergistic Activities

1. Community Outreach: Advisor, Engineers Without Borders (since 2017)
2. Recruitment of Underrepresented Groups: Recruited and supervised 3 female undergraduate student, 3 female graduate students, 4 female postdoctoral fellows, 5 female scientists (to date)
3. STEM Development: Chair of APL SEED Postdoctoral Program (2017-2020)
4. Scientific Community Service: Organizing Committee, 72nd Annual Meeting of the American Physical Society Division of Fluid Mechanics Meeting, Seattle, WA (2019)
5. Scientific Community Service: Review manuscripts for science journals and proposals for funding agencies (ongoing)

BIOGRAPHICAL SKETCH: Roxanne J Carini

(a) Professional Preparation

Institution	Location	Major/Area of Study	Degree	Year
Yale University	New Haven, CT	Applied Mathematics	BS	2011
University of Washington	Seattle, WA	Civil & Environmental Engineering	MSCE	2014
University of Washington	Seattle, WA	Civil & Environmental Engineering	PhD	2019
University of Washington	Seattle, WA	Ocean Physics Department, Applied Physics Laboratory	Postdoctoral Scholar	2021

(b) Appointments

From – To	Position Title, Organization and Location
09/2021 – Present	Senior Oceanographer, Northwest Association of Networked Ocean Observing Systems (NANOOS) at Applied Physics Laboratory, University of Washington, Seattle, WA
09/2020 – 09/2021	Research Associate, NANOOS at Applied Physics Laboratory, University of Washington, Seattle, WA
03/2020 – 09/2020	Independent Contractor - U.S. Marine Mammal Commission, Bethesda, MD
03/2019 – 03/2020	NOAA Sea Grant John A Knauss Marine Policy Fellow, U.S. Marine Mammal Commission, Bethesda, MD
07/2011 – 12/2018	Graduate Research Assistant, University of Washington, Applied Physics Laboratory, Seattle, WA

(c) Publications (Products most closely related to the proposed project)

Carini, R.J., C.C. Chickadel, A.T. Jessup (2021), Surf Zone Waves at the Onset of Breaking: 2. Predicting Breaking and Breaker Type, Journal of Geophysical Research: Oceans, 126, 4, https://doi.org/10.1029/2020JC016935.

Carini, R.J., C.C. Chickadel, A.T. Jessup (2021), Surf Zone Waves at the Onset of Breaking: 1. LIDAR and IR Data Fusion Methods, Journal of Geophysical Research: Oceans, 126, 4, https://doi.org/10.1029/2020JC016934.

Buscombe, D., R.J. Carini, S.R. Harrison, C.C. Chickadel, J.A. Warrick (2020), Optical Wave Gauging Using Deep Neural Networks, Coastal Engineering, 155, 103593, https://doi.org/10.1016/j.coastaleng.2019.103593.

Buscombe, D., and R.J. Carini (2019), A Data-Driven Approach to Classifying Wave Breaking in Infrared Imagery, Remote Sensing, 11, 859, https://doi.org/10.3390/rs11070859.

Carini, R.J., C.C. Chickadel, A.T. Jessup, and J. Thomson (2015), Estimating Wave Energy Dissipation in the Surf Zone Using Thermal Infrared Imagery, Journal of Geophysical Research: Oceans, 120, 3937-3957, https://doi org/10 1002/2014JC010561

(d) Synergistic Activities

Outreach and Education: Partnered with the Technology Access Foundation (Seattle non-profit), to bring STEM opportunities to students from traditionally underserved and underrepresented communities. Co-led three seventh grade classes through a primer on Marine Heatwaves, a demonstration of the NANOOS Tuna Fishers and Climatology apps, and student-led inquiry of data to identify and discuss Marine Heatwaves in the region.

Mentorship: Coordinated and co-mentored a Louis Stokes Alliance for Minority Participation (LSAMP) undergraduate intern with NANOOS.

Science Community Service: Served as moderator and science judge for National Ocean Science Bowl 2019, 2020, and 2021.

Scientific Community Service: Review manuscripts for science journals

Navy-related Experience: Naval Research Enterprise Internship Program, Graduate Research Intern, Jun 2016 - Aug 2016, US Naval Research Laboratory, Stennis, MS

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University of Washington, Applied Physics Laboratory
Seattle, WA 98105 Phone: (206) 543-6431, Email: emiliom@uw.edu
ORCID: 0000-0003-2574-4623 https://github.com/emiliom/

(a) Professional Preparation:

University of Washington	Chemical Oceanography	Ph.D., 2004
University of Washington	Chemical Oceanography	M.S., 1997
Massachusetts Institute of Technology	Environmental Engineering Science	B.S., 1992

(b) Appointments:

2009 – present Senior Oceanographer, U. of Washington, Applied Physics Lab., Seattle
2007 – 2008 Research Associate, Inst. Marine & Coastal Sci., Rutgers U., NJ
2001 – 2006 Principal GIS Analyst, Surface Water Management, Snohomish County, WA
1993 – 2001 Graduate Research Assistant, U. of Washington, Oceanography, Seattle

(c) Selected Publications or Products:

1. NANOOS Visualization System (NVS), http://nvs.nanoos.org
2. WikiWatershed - ModelMyWatershed Application, https://modelmywatershed.org
3. Barth JA, Allen SE, Dever EP, Dewey RK, Evans W, Feely RA, Fisher JL, Fram JP, Hales B, Ianson D, Jackson J, Juniper K, Kawka O, Kelley D, Klymak JM, Konovsky J, Kosro PM, Kurapov A, Mayorga E, et al. 2019. Better Regional Ocean Observing Through Cross-National Cooperation: A Case Study From the Northeast Pacific. *Frontiers in Marine Science* 6:93, doi:10.3389/fmars.2019.00093
4. Hsu, L., E. Mayorga, J.S. Horsburgh, M.R. Carter, K.A. Lehnert and S.L. Brantley. 2017. Enhancing interoperability and capabilities of Earth Science data using the Observations Data Model 2 (ODM2). *Data Science Journal* 16(4):1-16, doi:10.5334/dsj-2017-004
5. Mayorga, E., T. Tanner, R. Blair, A.V. Jaramillo, N. Lederer, C.M. Risien and C. Seaton. 2010. The NANOOS Visualization System (NVS): Lessons learned in data aggregation, management and reuse, for a user application. *Proc. MTS/IEEE Oceans'10*, doi:10.1109/OCEANS.2010.5663792
6. Mayorga, E., S.P. Seitzinger, J.A. Harrison, et al. 2010. Global Nutrient Export from WaterSheds 2 (NEWS 2): Model development and implementation. *Environmental Modeling & Software* 25: 837-853, doi:10.1016/j.envsoft.2010.01.007

(d) Synergistic Activities:

1. University of Washington hackweeks co-organizer and tutorial developer: GeoHackWeek 2016 – 2019; OceanHackWeek 2018 – present; WaterHackWeek 2019 – present.
2. Mentored several undergraduates in environmental data processing and analysis projects.
3. Member of Pacific NW Louis Stokes Alliance for Minority Participation (LSAMP) UW Faculty Mentoring Committee, 2021.
4. Environmental Data Science Inclusion Network (EDSIN) community member, since 2020.
5. Northwest Association of Networked Ocean Observing Systems (NANOOS), the US Pacific Northwest Regional Coastal Ocean Observing System for the US Integrated Ocean Observing System (IOOS), 2009 – 2020. Data management lead, 2013 – 2019.
6. Ocean Networks Canada, International Science Advisory Board member, since 2018.

Lowell Jones, SPRH

Functional Specialties

- Workforce Planning & Employment
- Recrutiement and Sourcing
- HR Training & Development
- Employee & Labor Relations

Education & Certifications

B.Sc. – Virginia Polytechnic & State University (Virginia Tech), Blacksburg, VA

Pamplin College of Business
Human Resources/Entrepreneurship, Innovation, and Technology concentration
Business Development & Leadership Minor

Senior Professional in Human Resources® (SPHR®) Certification

Human Resources Certification institute (HRCI)

Professional Experience

Recruitment & Employee Development Manager - **Applied Physics Laboratory, UW** **Seattle, WA**
Sept 2020 to present

• Create and implement programs that attract, develop, and retain high quality employees as well as oversees programs which directly support the Laboratory's people-related strategies, and pertain to the recruitment, training and development, mentoring, and career advancement of engineering, technical, and administrative staff and postdoctoral scholars.
• Serves as the integral connection between APL (and UW) and prospective employees through outward-facing recruitment initiatives, as well as future scientists and engineers through outreach initiatives to undergraduate and youth.
• Manage and administer onboarding and mentorship programs for all staff, students, and postdoctoral scholars.

HR Business Partner/Administrator - **Applied Physics Laboratory, UW** **Seattle, WA**
Jan 2017 to Sept 2020

• Designed, implemented, and managed effective and efficient Human Resources policies, procedures, and programs that are compliant with evolving Federal, State, and University policy, regulations, and guidelines.
• Primary Workday implementation and utilization specialist within the laboratory and the Office of Research. Responsible for reporting, liaising, and optimizing the systems capabilities to for operational HR use.
• Review promotions, in-grade salary increases, reclassifications and other salary/position changes and make recommendations concerning their approval.
• Interface with internal research center leadership and UW central Human Resources in Employee Relations actions ensuring a positive outcome to work performance issues.
• Served as primary liaison with the International Scholars Office and Academic HR and assist APL Centers with visa and other foreign scientist/staff/visit immigration needs.

HR Administrator - Applied Physics Laboratory, UW **Seattle, WA**
July 2014 - Jan 2017

- Lead the full program and processes recruitment of classified, permanent, and temporary employees
- Oversee all graduate and undergraduate appointment, hiring, promotional, and separation actions including research associates/post docs, research assistants, graduate students, undergraduate students, student helpers and interns.
- Assist the HR Director and individual APL Executive staff members in achieving strategic goals and personal and professional development objectives.
- Lead New Employee onboarding, UW Orientation, and integration into UW/APL environment and systems
- Interpret and administer all aspects of FMLA/family medical leave use

HR & Training Associate - University of Virginia **Charlottesville, VA**
Feb 2013 - July 2014

- First point of contact for over 1300 employees supporting all levels of management in Energy & Utilities, Engineering, and UVA Hospital and Campus Operations on staffing, employee relations, classification, and FMLA/short-term disability/worker's compensation
- Responsible for on-going promotion of training development opportunities available internally and externally to the university by conducting need-specific trainings to supervisors, managers, and directors.
- Designed and facilitated yearly Leadership Forum, a 2-day event focused on training 200+ directors, managers, and front line supervisors in certain essential and rapidly changing human resources procedures so they were better equipped to navigate challenging situations in their role.
- Conducted Manager Enrichment sessions, which provided 50+ senior level managers and directors with opportunities for networking and leadership development designed to engage the participants and teach them new skills.

HR - Planning & College Recruiting Assistant - Norfolk Southern Corporation **Norfolk, VA**
Aug 2011 - Dec 2011

- Managed candidate administration through the entire Norfolk Southern hiring process for Management Trainee and Operations Supervisor positions. Including market research, job posting, resume and application screening, generating spreadsheets and reports to track candidate data, assessment test administration, scheduling and coordinating career/interview day, interviewing, and offers.
- Coordinated office administration for traveling College Recruiting and HR Planning Asst managers.
- Responsible for contacting candidates, coordinating approved travel arrangements, event planning and execution of non-local career/interview sessions.
- Multi-tasked using specific subject knowledge to complete deadline driven special projects from other areas in HR such as, EEO, Benefits and Compensation, and Training and Development.

UW Service

- Office of Research Diversity, Equity, & Inclusion Committee
- Diversity Council
- HR Community of Practice - Programming Committee
- Distinguished Staff Awards, DSA Selection Committee

Current and Pending – Andrew Jessup

Current Support:

Project Title: RAPID: Simultaneous Remote Measurement of Skin and Sub-skin Temperature for Ships, USVs, & Buoys
Summary: Development of IR radiometer system
Source of Support: National Science Foundation (NSF), OCE-2009985
Total Direct Costs: $106,518
Percentage Effort Devoted to Project: 25%
Prime Offeror : Applied Physics Laboratory, University of Washington
Technical Contact: Andrew Jessup
1013 NE 40th Street, Box 355640
Seattle, WA 98105-6698
Phone: (206) 685-2609 Email: jessup@apl.washington.edu
Period of Performance: 1/1/2020 – 12/31/2021
Total Award Amount: $117,007
Person-Months Per Year Committed to Project: 1.0
Relationship to the Proposed Effort and Degree of Overlap: None

Project Title: National Marine Renewable Energy Center Upgrades
Summary: Development of hydropower turbines
Source of Support: Department of Energy. DE-EE0008955
Total Direct Costs: $4,824,380
Percentage Effort Devoted to Project: 5%
Prime Offeror : Department of Mechanical Engineering, University of Washington
Technical Contact: Brian Polagye
3900 E Steven Way NE, Box 352600
Seattle, WA 98195
Phone: (206) 543-7544 Email: bpolagye@uw.edu
Period of Performance: 4/1/2020 – 9/30/2021
Total Award Amount: $5,000,000
Person-Months Per Year Committed to Project: 0.38, 0.13
Relationship to the Proposed Effort and Degree of Overlap: None

Project Title: Simultaneous Remote Measurement of Skin and Sub-skin Temperature for USVs & Buoys
Summary: Development of IR radiometer system
Source of Support: National Science Foundation (NSF), OCE-2022750
Annual Direct Costs: $289,811 / $245,610 / $118,668
Percentage Effort Devoted to Project: 10%
Prime Offeror : Applied Physics Laboratory, University of Washington
Technical Contact: Andrew Jessup
1013 NE 40th Street, Box 355640
Seattle, WA 98105-6698
Phone: (206) 685-2609 Email: jessup@apl.washington.edu

Period of Performance: 8/15/2020 – 7/31/2023
Total Award Amount: $699,330
Person-Months Per Year Committed to Project: 1.0, 1.0, 1.5
Relationship to the Proposed Effort and Degree of Overlap: None

Project Title: Infrared Remote Sensing of Cooling Whitecap Foam to Quantify Wave Breaking and Aeration
Summary: Exploitation of cooling foam signature to quantify dissipation due to breaking waves
Source of Support: National Science Foundation (NSF), OCE-2048616
Annual Direct Costs: $268,708 / $185,892
Percentage Effort Devoted to Project: 5%
Prime Offeror : Applied Physics Laboratory, University of Washington
Technical Contact: C. Christopher Chickadel
1013 NE 40th Street, Box 355640
Seattle, WA 98105-6698
Phone: (206) 221-7673 Email: carmine@uw.edu
Period of Performance: 3/1/2021 – 2/28/2023
Total Award Amount: $532,360
Person-Months Per Year Committed to Project: 0.5, 0.25
Relationship to the Proposed Effort and Degree of Overlap: None

Pending Support:

Proposal Title: DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce
Summary: This proposal
Source of Support: Office of Naval Research
Annual Direct Costs: $114,864 / $231,085 / $201,788
Percentage Effort Devoted to Project: 5%
Prime Offeror : Applied Physics Laboratory, University of Washington
Technical Contact: Andrew Jessup
1013 NE 40th Street, Box 355640
Seattle, WA 98105-6698
Phone: (206) 685-2609 Email: jessup@apl.washington.edu
Period of Performance: 4/15/2022 – 4/14/2025
Total Award Amount: $600,000
Person-Months Per Year Committed to Project: 0.40, 0.25, 0.0
Relationship to the Proposed Effort and Degree of Overlap: This proposal

Current Support **Investigator: Roxanne Carini**

Project/Proposal Title:	LiveOcean Model Enhancement and Transition to Operations
Source of Funding:	National Oceanic and Atmospheric Administration (NOAA)
Sponsor Contact:	Debra Esty, 240-533-9446, debra.esty@noaa.gov
Status:	Current, Grant NA21NOS0120168
Prime Offeror/Subs:	Univ. of Washington / None
PI/Technical Contact:	Parker Maccready, Oceanography, Univ. of Washington 1503 NE Boat St, Box 357940, Seattle, WA 98195-7940 206-685-9588, Fax 206-543-6073, pmacc@uw.edu
Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$899,407
Period of Performance:	09/01/2021 – 08/31/2024
Person-Months per Year:	Cal: 2.00, 2.75, 2.45 | Acad: | Sumr:

Project/Proposal Title:	Sustaining NANOOS, the Pacific Northwest component of the US IOOS
Source of Funding:	National Oceanic and Atmospheric Administration (NOAA)
Sponsor Contact:	Oriana Villar, 240-533-9466, oriana.villar@noaa.gov
Status:	Current, Grant NA21NOS0120093
Prime Offeror/Subs:	Univ. of Washington / None
PI/Technical Contact:	Jan A. Newton, Applied Physics Lab, Univ. of Washington 1013 NE 40th Street, Box 355640, Seattle, WA 98105-6698 206-543-9152, Fax 206-543-6785, janewton@uw.edu
Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$20,670,035
Period of Performance:	07/01/2021 to 06/30/2026
Person-Months per Year:	Cal: 4.6, 4.6, 4.6, 4.6, 4.6| Acad: | Sumr:

Project/Proposal Title:	UW Friday Harbor Labs Teaching/Instruction
Source of Funding:	UW Friday Harbor Labs Academic Programs
Sponsor Contact:	N/A
Status:	Current
Prime Offeror/Subs:	Univ. of Washington
PI/Technical Contact:	Roxanne Carini, Applied Physics Lab, Univ. of Washington 1013 NE 40th Street, Box 355640, Seattle, WA 98105-6698 206-685-8326, Fax 206-543-6785, rjcarini@uw.edu
Administrative Contact:	N/A
Total Award Amount:	N/A
Period of Performance:	9/16/21 to 12/15/21
Person-Months per Year:	Cal: 0.4 | Acad: | Sumr:

Project/Proposal Title:	RVA-OA2-17, The Olympic Coast as a Sentinel: An Intergrated Social-Ecological Regional Vulnerability Assessment to Ocean Acidification
Source of Funding:	National Oceanic and Atmospheric Administration (NOAA)
Sponsor Contact:	Dr. Erica Ombres, 301-734-1072, Erica.h.ombres@noaa.gov
Status:	Current, NA17OAR0170166 AM01
Prime Offeror/Subs:	Univ. of Washington/None
PI/Technical Contact:	Jan Newton Applied Physics Lab, Univ. of Washington 1013 NE 40th Street, Box 355640, Seattle, WA 98105-6698 206-543-9152, Fax 206-543-6785, janewton@uw.edu
Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$700,000
Period of Performance:	09/01/2017 to 02/28/2022
Person-Months per Year:	Cal: 0.7 (2021 to 2022) | Acad: | Sumr:

Pending Support **Investigator: Roxanne Carini**

Project/Proposal Title:	NSF Convergence Accelerator Track E: Equipping Underserved Communities with Ocean Intelligence Platforms
Source of Funding:	National Science Foundation (NSF)
Sponsor Contact:	Lara Campbell, 703-292-7049, LCampbel@nsf.gov
Status:	Pending, Submitted Proposal
Prime Offeror/Subs:	Univ. of Washington / None
PI/Technical Contact:	Jan A. Newton, Applied Physics Lab, Univ. of Washington 1013 NE 40th Street, Box 355640, Seattle, WA 98105-6698 206-543-9152, Fax 206-543-6785, janewton@uw.edu
Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$750,000
Period of Performance:	09/15/2021 - 09/14/2022
Person-Months per Year:	Cal: 2.15 | Acad: | Sumr

Project/Proposal Title:	Value of the Pacific Northwest HAB Forecast
Source of Funding:	National Oceanic and Atmospheric Administration (NOAA)
Sponsor Contact:	Felix A. Martinez, Ph.D.,734-741-2254, Felix.Martinez@noaa.gov
Status:	Pending Revision
Prime Offeror/Subs:	Woods Hole Oceanographic Institution/Sub: UW
PI/Technical Contact:	Ryan McCabe, JISAO, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-685-0599, Fax 2 (206) 685-3397, rmm@uw.edu

Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$201,022
Period of Performance:	09/01/2020-8/31/2023
Person-Months per Year:	Cal: 0.00, 0.25, 0.25 | Acad: | Sumr:
Project/Proposal Title:	DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce
Source of Funding:	Office of Naval Research (ONR)
Sponsor Contact:	Veronica Lacey, 619-221-5494 veronica.lacey@navy.mil
Status:	Pending Proposal Submission (This Proposal)
Prime Offeror/Subs:	Univ. of Washington / None
PI/Technical Contact:	Andrew T. Jessup, Applied Physics Lab, Univ. of Washington 1013 NE 40th Street, Box 355640, Seattle, WA 98105-6698 206-685-2609, Fax 206-543-6785, jessup@uw.edu
Administrative Contact:	Carol Rhodes, Sponsored Programs, Univ. of Washington 4333 Brooklyn Ave NE, Box 359472, Seattle, WA 98195-9472 206-543-4043, Fax 206-685-1732, osp@uw.edu
Total Award Amount:	$600,000
Period of Performance:	04/15/2022 - 04/14/2025
Person-Months per Year:	Cal: 1.00, 0.5, 0.0 | Acad: | Sumr:

Current and Pending Support - Emilio Mayorga

Current Support:

Project/Proposal Title:	**Sustaining NANOOS, the Pacific Northwest component of the US IOOS**
Description:	The primary mission of the user-driven NANOOS is to provide PNW stakeholders with the ocean data, tools, and information they need to make responsive and responsible decisions, appropriate to their individual and collective societal roles.
Source of Support:	National Oceanic and Atmospheric Administration
Award Number:	NA16NOS0120019
Person-Months per Year:	3.45 Calendar Months
Period of Performance:	06/01/16 – 05/31/22
Location of Project:	University of Washington, Seattle, WA
Total Award Amount:	$56,500 (Mayorga)

Project/Proposal Title:	**Collaborative Research: CYBER Training: CIU: Data Streams, Model Workflows, and Educational Pipelines for Hydrologic Sciences**
Description:	Our vision is that cyberinfrastructure like HydroShare can be effectively used to advance science of complex earth system processes by providing the software for model application and analytics, but more importantly, by facilitating a collective exploration and interaction processes among users.
Source of Support:	National Science Foundation
Award Number:	1829585
Person-Months per Year:	1.0 Calendar Months
Period of Performance:	09/01/18 – 08/31/22
Location of Project:	University of Washington, Seattle, WA
Total Award Amount:	$37,580 (Mayorga)

Project/Proposal Title:	**Biogeochemical Processes along the Lower Amazon River Continuum**
Description:	This project, with a focus on the Amazon River, will provide greater insights into how riverine carbon cycles function, and ultimately their influence on global cycles.
Source of Support:	National Science Foundation
Award Number:	1754317
Person-Months per Year:	3.4 Calendar Months
Period of Performance:	06/01/18 – 05/31/22
Location of Project:	University of Washington, Seattle, WA
Total Award Amount:	$83,179 (Mayorga)

Project/Proposal Title:	**Collaborative Conference: OceanHackWeek: A Workshop to Explore Data Science in Oceanography**
Description:	Oceanhackweek aims to address the urgent need for computational and data science skills by combining immersive tutorials on state-of-the-art data science methodologies, peer-learning, and on-site collaborative hack project work in a 5-day intensive workshop.
Source of Support:	National Science Foundation
Award Number:	2038697
Person-Months per Year:	0.15 Calendar Months
Period of Performance:	08/01/20 – 08/31/22
Location of Project:	University of Washington, Seattle, WA
Total Award Amount:	$42,487 (UW-APL)

Pending Support:

Project/Proposal Title:	**DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce (this proposal)**
Description:	This proposal
Source of Support:	Office of Naval Research
Person-Months per Year:	1.0 Calendar Months
Period of Performance:	04/15/22 – 04/14/25
Location of Project:	University of Washington, Seattle, WA
Total Award Amount:	$37,247 (Mayorga)

UNIVERSITY *of* WASHINGTON

UNDERGRADUATE ACADEMIC AFFAIRS

Office of the Dean

October 1, 2021

To the Office of Naval Research:

We are writing to strongly endorse the proposal entitled DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce being submitted to the ONR FOA Announcement N00014-21-S-F004, submitted by Andrew Jessup at the Applied Physics Laboratory (APL). In addition, the UW Undergraduate Research Program (URP) will participate in the proposed program, which provides an important opportunity for students to explore potential career options in Oceanography. We are excited about APL's proposal because we know from educational research that students who participate in undergraduate research show gains in overall success and retention in higher education, and that the impact of these experiences is strongest for students from populations currently underserved in higher education. This project will provide opportunities to those students who need it most, and who stand to benefit enormously from their experiences.

This collaboration builds on a longstanding relationship that URP has shared with APL in support of undergraduate research, and we look forward to deepening that partnership by providing training and support for both the undergraduate student interns and research staff mentors. URP will participate in five ways:

- Providing weekly instruction for interns on scientific writing, research presentation skills ethics, etc.;
- Organizing student-centered events for networking, professional development, and graduate school planning;
- Offering advising and individualized student support;
- Coordinating a culminating summer undergraduate research symposium and helping students navigate the process of presenting at this important networking event; and
- Supporting mentors through orientation and workshops.

As described in the project proposal, the URP will invite summer interns to participate in activities supporting their development as scientists. The URP summer STEM research seminar will complement the APL internship events and short course in research methods. URP staff provide individualized advising to summer interns to ensure each student makes the most of their summer experience and leaves with a plan for their next steps. Networking events for interns with graduate students, postdocs, and undergraduates in other STEM areas provide a way for students to develop professional contacts that further support their career development.

URP will provide workshops for mentors guiding the APL summer interns, supporting mentors to create equitable and inclusive research environments, to foster student learning, growth and independence, and to resolve challenges that emerge in the mentoring environment.

We are pleased to work in partnership with APL on this new program and look forward to supporting your students and mentors.

Sincerely,

(b) (6)

Janice DeCosmo, PhD
Associate Dean
Associate Vice Provost for Undergraduate Research

(b) (6)

Sophie Pierszalowski, PhD
Director, URP

References for claims in paragraph 1:

Gregerman, S. R., Lerner, J. S., Von Hippel, W., Jonides, J., & Nagda, B. A. (1998). Undergraduate student-faculty research partnerships affect student retention. *The Review of Higher Education*, *22*(1), 55-72.

Brownell, J. E. & L. E. Swaner (2010). Five High-Impact Practices: Research on Learning Outcomes, Completion, and Quality. Association of American Colleges and Universities, Washington, DC, 80 pp.

UNIVERSITY of WASHINGTON
OFFICE OF MINORITY AFFAIRS & DIVERSITY
Pacific Northwest Louis Stokes Alliance for Minority Participation

September 30, 2021

Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Dear Office of Naval Research:

Re: Letter of support for *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce*

I am June Summers Hairston, Ed.D., Director of the Pacific Northwest, (PNW) Louis Stokes Alliance for Minority Participation (LSAMP) in Science, Technology, Engineering and Math (STEM). PNW LSAMP is funded by the National Science Foundation (NSF). We are an Alliance of five four-year Pacific Northwest institutions, and five two-year partner colleges, of which the University of Washington serves as the Lead Institution. As the Lead Institution, we are located at the University of Washington and housed under the Office of Minority Affairs and Diversity. Our overall mission is to support historically underrepresented students in STEM. Our grant goals and objectives are: to increase the number of highly competitive underrepresented student's bachelor's degree recipients in STEM, including those who have transferred from a 2-year institution by 50% over a five-year period; increase the number of underrepresented students who pursue graduate studies in STEM by 5-10% a year; and lastly – to address produce and disseminate new scholarly research on broadening participation of underrepresented students in STEM disciplines and workforce through a multi-year mixed methods study and four one-year sprint studies conducted by partner institutions.

Over the past 13 years, we have successfully provided academic support and encouraged persistence in STEM by creating a strong community and a sense of belonging for underrepresented students in our program. A strong network of individuals, strategies and interventions address the academic and social integration necessary to support recruitment, retention and graduation of our scholars. A few of our services offered are: providing the LSAMP Center, a place where students call "home away from home" as they gather to study in a safe and supportive environment, summer bridge, orientation, information and skill-building workshops, study groups, research, internships, study abroad, leadership and mentorship programs designed to improve retention, academic performance and graduation rates of underrepresented STEM students. Partnerships with cross-campus departments and graduate preparation programs provide research opportunities, and undergraduate mixers with graduate students, and faculty help to increase the rate of students indicating plans to pursue graduate school. The longitudinal alliance-wide research project

Mary Gates Hall Suite 311 Box 352835 Seattle, WA 98195-2835
phone 206.685.3422 fax 206.221.0353 lsamp@uw.edu depts.washington.edu/lsamp/

mentioned earlier provides collaboration with institutional partners on broadening participation of underrepresented scholars in STEM disciplines and the STEM workforce. Our multi-year mixed methods study and four one-year sprint studies are in progress and have thus far resulted in publishing conference papers and peer-reviewed articles. We are proud of the work we have accomplished with our campus and industry partners.

I am pleased to submit this letter of support for the proposal entitled *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce* submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the *ONR FOA Announcement N00014-21-S-F004*. We support this proposal because it aligns with our organization's efforts to establish and foster robust and supportive research and professional development programs for students from communities traditionally underrepresented in STEM fields.

UW LSAMP recognizes the importance of diversifying the STEM workforce and dismantling the systemic barriers that obstruct student access and success. This proposal contributes to the work within the larger community to improve access, provide resources, and support students. We thank the Department of the Navy and the Office of Naval Research for this opportunity.

Sincerely,

(b) (6)

June Summers Hairston, Ed.D.
Director of Pacific Northwest Louis Stokes
Alliance for Minority Participation (PNW LSAMP)
In Science, Technology, Engineering & Math (STEM)
206-685-3422
jhair@uw.edu

NSBE UW

National Society of Black Engineers,
University of Washington, Seattle.

9/28/2021

Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Dear Office of Naval Research:

Re: Letter of support for *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce*

NSBE-UW is a diverse student group of STEM and Engineering Students of Color located at the University of Washington, Seattle. NSBE-UW's mission is to increase the number of culturally responsible Black Engineers who excel academically, succeed professionally, and positively impact the community. We accomplish this goal by increasing our campus and national membership recruitment, interacting with employers and companies for professional connections, and hosting regional and national events on the same.

I am pleased to submit this letter of support for the proposal entitled *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce* submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the *ONR FOA Announcement N00014-21-S-F004*. We support this proposal because it aligns with our organization's efforts to increase STEM awareness to underrepresented minorities and persons while encouraging their professional development in highly technical and in-demand fields.

NSBE-UW recognizes the importance of diversifying the STEM workforce and the systemic barriers to doing so. This proposal contributes to the work within the larger community to improve access, provide resources, and support students. We thank the Department of the Navy and the Office of Naval Research for this opportunity.

Sincerely,

The Executive Board, 2021-2022,

NSBE-UW.

NORTHWEST INDIAN COLLEGE
Xwlemi Elh>Tal>Nexw Squl
2522 Kwina Road, Bellingham, Washington 98226-9217

September 29th, 2021

Dr. Melissa Peacock
Director, Salish Sea Research Center
Northwest Indian College
Bellingham, WA, 98226

Re: Letter of support for *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce*

To Whom It May Concern:

The Salish Sea Research Center at Northwest Indian College is the only marine research center in the tribal college and university system, and is located in Bellingham, WA. Our primary goal at Northwest Indian College is to use education to promote Indigenous self-determination and knowledge, and serve the educational and training needs of Pacific Northwest tribes. The Salish Sea Research Center supports this mission by providing hands-on experiential STEM learning for the undergraduate students at Northwest Indian College, focused on marine research that supports food and data sovereignty.

The Salish Sea Research Center strongly supports the proposal entitled: *"DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce"* submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the *ONR FOA Announcement N00014-21-S-F004*. Their goal to support students through internships, professional development programs, and the inclusion of underrepresented STEM students. This is aligned with our existing Salish Sea Research Center priorities to open pathways to mainstream science professions for our Indigenous students.

As a tribal university, especially one that is on the Salish Sea and in close proximity to University of Washington, we recognize the importance of diversifying the STEM workforce and the systemic barriers to doing so. This proposal contributes to the work within the larger community to improve access, provide resources, and support students. We thank the Department of the Navy for this opportunity.

Sincerely,

(b) (6)

Dr. Melissa Peacock
Director, Salish Sea Research Center, Northwest Indian College
(360) 594-4082
mpeacock@nwic.edu

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232

(503) 238-0667
F (503) 235-4228
www.critfc.org

September 29, 2021

Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Re: Letter of support for the *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce* Proposal

Dear Proposal Reviewer:

I am pleased to submit this letter of support for the proposal titled *DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce* submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the *ONR FOA Announcement N00014-21-S-F004*. We support this proposal because it aligns with our organization's efforts to develop tribal workforce opportunities and ensures that tribal interests, experience, and knowledge are represented in oceanographic research and decision making.

CRITFC was formed in 1977 by the four Columbia River treaty fishing tribes: the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe. As an extension of tribal government, CRITFC acts as the technical support and coordinating agency on Columbia Basin fisheries and fisheries policy for its member tribes. The ceded territories of CRITFC's member tribes comprise 66,500 km^2 in Washington, Oregon, and Idaho, which represents 84 percent of the range above Bonneville Dam still accessible to Columbia Basin salmon.

CRITFC recognizes the importance of diversifying the STEM workforce and the systemic barriers to doing so. This project will support tribal students to participate in summer undergraduate internships and directly expose them to the ocean environment and familiarize them with maritime careers in science and technology. We look forward to collaborating with the University of Washington on these potential mentoring opportunities that will ultimately help inform efforts to reverse the decline of salmon.

Sincerely,

(b) (6)

Aja K. DeCoteau
Interim Executive Director

DEPARTMENT OF THE NAVY
NAVAL UNDERSEA WARFARE CENTER DIVISION
610 DOWELL STREET
KEYPORT, WASHINGTON 98345-7610

3960
Ser 00/072
Sept 30, 2021

Dr. Michael Simpson
Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Dr. Simpson:

SUBJECT: LETTER OF SUPPORT FOR DEVELOPING AN INCLUSIVE AND DIVERSE NAVAL OCEANOGRAPHIC WORKFORCE

Naval Undersea Warfare Center (NUWC) Division, Keyport is a Navy Lab located in the Pacific Northwest. As part of the Navy Research and Development Enterprise, NUWC Division, Keyport's mission is to support the Fleet with the technology to maintain and expand our technical advantage. Partnering with local institutions is a key element of our strategy to ensure we have the highly educated workforce required to fulfil our mission.

I am pleased to submit this letter of support for the proposal entitled Developing An Inclusive And Diverse Naval Oceanographic Workforce (DID-NOW): Developing an Inclusive and Diverse Naval Oceanographic Workforce submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the ONR FOA Announcement N00014-21-S-F004. We support this proposal as it aligns with our organization's strategic initiative to develop a diverse, well-educated workforce ready to meet the Navy's challenges of today and tomorrow.

NUWC Division, Keyport recognizes the importance of diversifying the Science, Technology, Engineering and Mathematics workforce and the systemic barriers to doing so. This proposal contributes to the work within the larger community to improve access, provide resources, and support students. We thank the Department of the Navy and the Office of Naval Research for this opportunity.

Sincerely,

AARON DARNTON
Chief Technology Officer
By direction

Northwest Association of Networked Ocean Observing Systems

29 September 2021

Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Dear Office of Naval Research:

I am pleased to submit this letter in strong support of the proposal entitled "*DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce"* submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the *ONR FOA Announcement N00014-21-S-F004*. I write as Executive Director of the Northwest Association of Networked Ocean Observing Systems, NANOOS (www.nanoos.org). As part of the U.S. Integrated Ocean Observing System (IOOS), NANOOS serves Pacific Northwest by bringing decision-critical information and data products to connect various sectors of society with coastal ocean data for myriad uses. Our efforts connect us with people, from shellfish growers to tribal and state managers, to ship operators, to surfers, in order to understand their knowledge needs. We seek not only a broader audience, but also to partner in training a more diverse next generation of ocean observers, modelers, data analysts, and engagement specialists. Recently I established an "Enabling Change" working group to seek solutions on to do this.

This proposal aligns with NANOOS' efforts to establish and foster robust and supportive research and professional development programs for students from communities traditionally underrepresented in STEM fields. We at NANOOS, a collective of eight Pacific Northwest academic, state, and tribal organizations, governed by ~70 organizations comprising our Governing Council, are making proactive steps to do so. We view this effort as an opportunity to both contribute to and one that will synergize with our efforts. Connections with NANOOS PIs, at UW-APL, or through additional connections NANOOS can bring to this effort, will empower a more inclusive and diverse population to find jobs and satisfaction in the oceanographic workforce, including with the Navy. NANOOS recognizes the importance of diversifying the STEM workforce and the systemic barriers to doing so.

I appreciate that this proposal contributes to the work within the larger community to improve access, provide resources, and support students, and will look forward to engaging. I thank the Department of the Navy and the Office of Naval Research for this opportunity, and hope for the proposal's success.

Sincerely,

(b) (6)

Jan A. Newton, Ph.D.
NANOOS Executive Director
APL Senior Principal Oceanographer and UW Oceanography Affiliate Professor

PORT GAMBLE S'KLALLAM TRIBE
NATURAL RESOURCES DEPARTMENT
31912 Little Boston Rd. NE – Kingston, WA 98346

29 October 2021

Office of Naval Research
One Liberty Center
875 N. Randolph Street
Arlington, VA 22203-1995

Dear Office of Naval Research:

Re: Letter of support for DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce

The Port Gamble S'Klallam Tribe is a sovereign nation located in Kingston, Washington. The Tribe's vision is to achieve the full potential of the Port Gamble S'Klallam Tribal sovereign nation to be self-sufficient, proud, strong, healthy, educated, and respected. The mission of the Port Gamble S'Klallam Tribe is to exercise sovereignty and ensure self-determination and self-sufficiency through visionary leadership. The Tribe aims to ensure the health, welfare, and economic success of a vibrant community through education, economic development, preservation and protection of the rich culture, traditions, language, homelands, and natural resources of the Port Gamble S'Klallam Tribe.

I am pleased to submit this letter of support for the proposal entitled DID-NOW: Developing an Inclusive and Diverse Naval Oceanographic Workforce submitted by Principal Investigator Andy Jessup at the Applied Physics Laboratory, University of Washington, to the ONR FOA Announcement N00014-21-S-F004. I support this proposal because it aligns with the aspirations of the Port Gamble S'Klallam Tribe's mission. I further support this proposal because it aligns with the Tribe's efforts to establish and foster robust and supportive research and professional development programs for students from communities traditionally underrepresented in STEM fields.

The Port Gamble S'Klallam Tribe recognizes the importance of diversifying the STEM workforce and the systemic barriers. This proposal contributes to the work within the larger community to improve access, provide resources, and support students. I thank the Department of the Navy and the Office of Naval Research for this opportunity.

Sincerely,
Julianna M. Sullivan
Marine Biologist
Port Gamble S'Klallam Tribe